

Amendments to the Claims

The following includes the entire set of pending claims with mark-ups in accordance with proposed revisions to 37 C.F.R. § 1.121 allowing for amendments in revised format.

Please amend Claims 1-27 and 29-44.

Please add Claim 48.

Please cancel Claims 28 and 45-47.

A

1. (currently amended) ~~Imaging apparatus comprising an optical assembly, a light source assembly and an imaging detector, said assemblies being operative to provide an image at a TIR surface defined by said optical assembly, said light source assembly directing polarized light at said TIR surface in a manner to generate an evanescent field at said surface, said optical assembly having spaced apart top and bottom surfaces, said bottom surface including first and second gratings, said gratings being located and configured to direct light passing through the first grating from said source to said top surface and light reflected from said top surface passing through to said second grating to said detector respectively to cause TIR and an evanescent field associated therewith by a single reflection at the TIR surface.~~

An apparatus for imaging, comprising:

a light source emitting a polarized light beam;

an optical assembly including a top surface and a bottom surface, wherein (a) the bottom surface includes first and second grating portions positioned such that the light beam passes through the first grating portion, reflects at the top surface to provide an evanescent field adjacent the top surface, and exits the optical assembly through the second grating portion, and (b) the optical assembly accommodates positioning a specimen array within the evanescent field, such that the specimen array causes spatially distributed polarization changes in the cross-section of the light beam; and

a two-dimensional array detector positioned to detect the spatially distributed polarization changes in the light beam to provide an image of the specimen array.

2. (currently amended) ~~Apparatus as in~~ The apparatus of claim 1, wherein said first and second gratings comprise Bragg gratings.

3. (currently amended) ~~Apparatus as in~~ The apparatus of claim 1, wherein said first and second gratings comprise electrically alterable gratings, said apparatus also including means

for altering said first and second gratings in a manner to change the direction of light incident thereto.

4. (currently amended) ~~Apparatus as in~~ The apparatus of claim 3, wherein said first and second gratings comprise electrically alterable holograms.

5. (currently amended) ~~Apparatus as in~~ The apparatus of claim 1, ~~also including further~~ comprising a wavelength filter for selecting the wavelength of light from said light source assembly.

6. (currently amended) ~~Apparatus as in~~ The apparatus of claim 1, ~~also including further~~ comprising an arcuate adjusting mechanism for moving said light source assembly about an arcuate path to selected positions therealong to alter the angle of the light beam into the optical ~~element~~ assembly.

7. (currently amended) ~~Apparatus as in~~ The apparatus of claim 1, ~~including further~~ comprising a flow cell secured to said TIR top surface, said flow cell including an inlet port and an outlet port for flowing analyte across said TIR top surface.

8. (currently amended) ~~Apparatus as in~~ The apparatus of claim 1, ~~also including further~~ comprising a computer, said computer including means for converting images from said reflected light into ~~a convenient form for analysis~~ analytical data.

9. (currently amended) ~~Apparatus as in~~ The apparatus of claim 5, wherein said wavelength filter ~~means~~ comprises a filter wheel located to intercept light from said light source assembly, said apparatus including means for rotating said wheel.

10. (currently amended) ~~Apparatus as in~~ The apparatus of claim 5, wherein said wavelength filter ~~means~~ comprises a stack filter.

11. (currently amended) ~~Apparatus as in~~ The apparatus of claim 3, ~~further comprising~~ also including a plurality of imagers, each of said imagers being located at a position to capture an image generated in response to input light at a corresponding angle of incidence.

12. (currently amended) ~~Apparatus as in~~ The apparatus of claim 5, ~~also including further~~ comprising a plurality of imagers, each of said imagers being located at a position to capture an image generated in response to input light of a corresponding wavelength.

13. (currently amended) ~~Apparatus as in~~ The apparatus of claim 7, wherein said flow cell includes means for securing a slide thereto.

14. (currently amended) A cassette for use with a ~~TIR analyzing instrument~~ an imaging apparatus, said ~~instrument comprising a processing assembly having a polarized imaging apparatus including a~~ light source portion providing a polarized light beam, and a two-dimensional array detector adapted for providing an image based on spatially distributed polarization changes in the light beam, a reflected light analyzing portion and a locating portion for locating the cassette for TIR imaging of a specimen array on an optical element of said cassette comprising:

an optical element comprising ~~an upper TIR~~ a reflective surface to allow formation thereon ~~on which of a specimen array is formed,~~ said optical element being configured to ~~receive direct the polarized light beam directed to the TIR reflective surface, such that a reflection of the polarized light beam at the reflective surface generates and generating an evanescent field at the TIR surface in the vicinity of the specimen array; and~~

a mount or frame coupled to the optical element and having a locating portion engageable with a mating locating element of the ~~TIR instrument~~ two-dimensional array detector, said mount or frame being operable to locate at least a selected portion of the specimen array in the evanescent field.

15. (currently amended) ~~Imaging apparatus as in~~ The cassette of claim 14, wherein said ~~TIR reflective~~ surface comprises the upper surface of a transparent slide, said slide having a lower surface, said lower surface comprising at least one grating and said upper surface including an array of receptors thereon.

16. (currently amended) ~~Apparatus as in~~ The cassette of claim 14 ~~15,~~ wherein said at least one grating comprises a first grating positioned to intercept said polarized light beam from said light source ~~portion~~ and a second grating positioned to intercept said light beam after it has reflected from said upper ~~TIR~~ surface.

17. (currently amended) ~~Apparatus as in~~ The apparatus of claim 14, wherein said cassette and said ~~processing light source assembly~~ are configured for a single reflection of the light beam at the ~~TIR reflective~~ surface.

18. (currently amended) ~~Apparatus as in~~ The apparatus of claim 14, further including comprising a flow cell secured to said TIR reflective surface, said flow cell including an inlet port and an outlet port for flowing analyte across said specimen array.

19. (currently amended) ~~Apparatus as in~~ The apparatus of claim 15, wherein the at least one grating comprises an electrically alterable grating.

20. (currently amended) An ~~imaging apparatus for imaging, a specimen array within the evanescent field present upon reflection of a beam of light at a TIR surface~~ comprising:

a polarized light source emitting a polarized ~~extended beam of light beam;~~

an optical ~~element having~~ assembly including a TIR reflective surface ~~on which the adapted to allow placing thereon a specimen array is placed~~ and a surface having grating portions, the optical ~~element assembly~~ being placed to cause the light beam of light to pass through a first grating portion to direct the light beam to the TIR reflective surface ~~where the light beam is for being reflected only a single time at the TIR surface~~, the specimen array being within ~~the an~~ an evanescent field associated with the ~~total internal~~ reflection at the TIR reflective surface, and the light beam of light after said single reflection passing through a second grating portion, ~~said gratings being configured to pass the beam of light through them to the TIR surface and from the TIR surface to enable TIR effect to occur;~~ and a polarization-sensitive imaging detector, said detector detecting the light beam of light reflected from the TIR reflective surface including the spatially distributed polarization ~~change changes~~ caused by the specimen array.

21. (currently amended) The ~~imaging~~ apparatus of claim 20, wherein the light source and ~~the~~ imaging detector are constructed as a first separate assembly defining a processing assembly, and the optical ~~element assembly~~ is part of constructed as a second separate assembly defining a cassette, ~~and the cassette is being~~ removably ~~fitted coupled~~ to the processing assembly.

22. (currently amended) The ~~imaging~~ apparatus of claim 21, wherein the cassette comprises ~~the optical element having~~ an upper surface defining the TIR reflective surface on which the specimen array is placed and a lower surface having the first grating portion and the second grating portion, each grating portion positioned so that the light beam of light from the processing assembly will pass through the first grating portion into the optical

~~element assembly~~ and after reflection will pass through the second grating portion prior to exiting the optical ~~element assembly~~.

23. (currently amended) The ~~imaging~~ apparatus of claim ~~22~~ 21, wherein the cassette has a mount or frame portion to which the optical assembly is attached and the mount or frame portion has mating portions and the processing ~~unit assembly~~ has mating receiving portions such that by matingly ~~fitting~~ coupling the mating portions to the mating receiving portions the cassette is removably ~~fitted~~ coupled to the processing assembly.

24. (currently amended) The apparatus of claim ~~23~~ in which 21, further comprising at least one ~~of said grating portions~~ is electronically alterable grating and further comprising controllable electronics altering means for electronically controlling at least one grating whereby the angle of the light beam ~~of light~~ exiting from the at least one ~~electrically~~ electronically alterable grating may be varied.

A
25. (currently amended) The apparatus of claim ~~23~~ in which 21, wherein the light source in the processing assembly may be changed by an arcuate adjusting mechanism to be directed at selected different angles toward the optical ~~element assembly of the specimen assembly~~ assembly to alter the angle of the light beam into the optical ~~element assembly~~.

26. (currently amended) The apparatus of claim ~~23~~ 21, wherein said light source and said processing assembly are movable in relation to each other to enable selecting portions of the specimen array to be sequentially imaged.

27. (currently amended) ~~Apparatus in which total internal reflection of a light beam occurs at a TIR surface in which an evanescent field is created, by passing a beam of light into~~ An imaging apparatus, comprising:

an optical portion defined by an optical member or assembly of members defining an optical portion the improvement comprising;

a first grating portion at a surface of the optical portion at through which the a light beam is directed into the optical portion, the first grating portion being configured to direct the light beam through the optical portion to the TIR a reflective surface to cause total internal reflection at the TIR surface, thereby providing an evanescent field, such that, when a specimen array is placed within the evanescent field, spatially distributed polarization changes in the cross-section of the light beam result;

a second grating portion at a surface of the optical portion, the second grating portion being configured for the light beam to exit the optical portion through the second grating portion; and

a two-dimensional array detector, said detector resolving the light beam to provide an image based on the spatially distributed polarization changes.

28. (canceled)

29. (currently amended) The apparatus of claim 27 in which the light beam exits the optical portion after a single reflection at the TIR reflective surface.

30. (currently amended) The apparatus of claim 27, wherein in which the light beam is polarized prior to entering the optical portion.

31. (currently amended) The apparatus of claim 30, wherein in which the polarized light beam has a first coherent length and the optical portion has a first distance between the first grating portion and the TIR reflective surface and a second distance between the TIR reflective surface and the second grating portion, said first and second distances each being smaller than said first coherent length.

32. (currently amended) Imaging An imaging apparatus, comprising:

an optical assembly, a light source assembly and an imaging detector, said assemblies being operative to provide an image at a TIR surface defined by a top surface of said optical assembly, said light source assembly for directing at said TIR surface a polarized light beam having a first coherent length at a reflective surface in a manner to generate an evanescent field at said TIR reflective surface, such that when a specimen array is placed within the evanescent field, spatially distributed polarization changes in the cross-section of the light beam result;

said an optical assembly having a bottom surface spaced apart from said top reflective surface a distance smaller than said first coherent length, said bottom surface including first and second gratings grating portions, said gratings grating portions being located and configured to direct light passing through the first grating from said source to said TIR reflective surface through the first grating portion and to direct light reflected from said TIR reflective surface passing through to said second grating portion; and to said detector

respectively to cause TIR and an evanescent field associated therewith by a single reflection at the TIR surface

a two-dimensional array detector, said detector resolving the light beam to provide an image based on the spatially distributed polarization changes.

33. (currently amended) ~~Apparatus as in~~ The apparatus of claim 32, wherein said first and second gratings comprise Bragg gratings.

34. (currently amended) ~~Apparatus as in~~ The apparatus of claim 32, wherein said gratings comprise electrically alterable gratings, said apparatus also including means for altering said gratings in a manner to change the direction of light incident thereto.

35. (currently amended) ~~Apparatus as in~~ The apparatus of claim 34, wherein said gratings comprise electrically alterable holograms.

36. (currently amended) ~~Apparatus as in~~ The apparatus of claim 32, further comprising also including a wavelength filter for selecting the wavelength of light from said light source assembly.

37. (currently amended) ~~Apparatus as in~~ The apparatus of claim 32, further comprising also including an arcuate adjusting mechanism for moving said light source assembly about an arcuate path to selected positions therealong to alter the angle of the light into the optical element assembly.

38. (currently amended) ~~Apparatus as in~~ The apparatus of claim 32, further comprising including a flow cell secured to said TIR reflective surface, said flow cell including an inlet port and an outlet port for flowing analyte across said TIR reflective surface.

39. (currently amended) ~~Apparatus as in~~ The apparatus of claim 32, further comprising also including a computer, said computer including means for converting images from said reflected light into ~~a convenient form for analysis~~ analytical data.

40. (currently amended) ~~Apparatus as in~~ The apparatus of claim 36, wherein said wavelength filter ~~means~~ comprises a filter wheel located to intercept light from said light source assembly, said apparatus including means for rotating said wheel.

41. (currently amended) ~~Apparatus as in~~ The apparatus of claim 36, wherein said wavelength filter means comprises a stack filter.

42. (currently amended) ~~Apparatus as in~~ The apparatus of claim 32 34, further comprising also including a plurality of imagers, each of said imagers being located at a position to capture an image generated in response to input light at a corresponding angle of incidence.

43. (currently amended) ~~Apparatus as in~~ The apparatus of claim 36, further comprising also including a plurality of imagers, each of said imagers being located at a position to capture an image generated in response to input light of a corresponding wavelength.

44. (currently amended) ~~Apparatus as in~~ The apparatus of claim 38, wherein said flow cell includes means for securing a slide thereto.

45. (canceled)

46. (canceled)

47. (canceled)

48. (new) The apparatus of Claim 1, wherein the light beam undergoes total internal reflection at the top surface.